Docket No.: 1293.1770

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Kil-soo JUNG et al.

Application No. 10/791,284 Group Art Unit: 2621

Confirmation No. 8962

Filed: March 3, 2004 Examiner: Syed Y. Hasan

For: REPRODUCING APPARATUS AND METHOD, AND RECORDING MEDIUM

SUBMISSION OF VERIFIED TRANSLATION OF APPLICATION

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 1.78, the applicants submit herewith translation of the above-referenced application and a statement from the translator.

If there are any additional fees associated with filing of this Submission, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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CERTIFICATION OF TRANSLATION

I, ***Eun-mee Won***, an employee of Y.P. LEE, MOCK & PARTNERS of Koryo Bldg., 1575-1 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare under penalty of perjury that I understand the Korean language and the English language; that I am fully capable of translating from Korean to English and vice versa; and that, to the best of my knowledge and belief, the statement in the English language in the attached translation of ***Korean Patent Application No. 10-2003-0019684*** consisting of 12 pages, have the same meanings as the statements in the Korean language in the original document, a copy of which I have examined.

Signed this 5th day of June 2009

Eunmee Won

BROWSABLE SLIDE SHOW STILL IMAGE REPRODUCING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image reproducing apparatus, and more particularly, to a slid show still image reproducing apparatus.

2. Description of the Related Art

The amount of video object data is very bulky and thus needs to be compressed using time-space compression and recorded on an information storage medium. In general, compression and encoding of data are performed under the Motion Picture Expert Groups (MPEG) standards prescribed by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Audio data can also be compressed under the MPEG standards or AC3 during encoding of image data, or converted into digital data using linear Pulse Code Modulation (PCM) without being compressed.

The encoded video data and the encoded audio data must be synchronized with each other. Therefore, for system multiplexing, time information is also encoded according to the MPEG standards and incorporated into both the encoded video object data and the encoded audio data.

FIG. 1 illustrates a hierarchical encoding method used during MPEG system encoding. Referring to FIG. 1, digitalized audio and video data are encoded using an audio encoder and a video encoder, respectively. The respective data output from the audio encoder and the video encoder are input to packetizers and processed as packetized elementary stream (PES) packets, respectively. Here, the PES packets are obtained by dividing the encoded audio and video data by predetermined sizes and packetizing the divided PES packets. The respective data for the PES packets are input to a program stream (PS) multiplexer and a transport stream (TS) multiplexer, and multiplexed to a program stream and a transport stream, respectively.

More specifically, during the multiplexing, the PES packets are divided into predetermined units, identification numbers are allocated to the divided portions of the PES packets, and the PES packets are multiplexed. The program stream is used for an information storage medium and multiplexed in the units of PS packs. A PS pack is 2,048 byte long in the video/audio standard that is a representative

standard for video data storage media.

The transport stream is used for digital broadcasting in which data loss is unavoidable, and multiplexed in the units of TS packets. A TS packet is fixed to be 188 bytes long. The use of TS streams becomes increased when digital broadcast data is recorded on an information storage medium.

FIG. 2 illustrates a basic format of data recorded to include arrival time of incoming packet data and the relationship between the arrival time and output time of data reproduced.

A recording/reproducing apparatus receives packet data from a transmitting side at the same intervals of time that the packet data was transmitted, and records the packet data on an information storage medium. To transmit the packet data to a decoder for reproduction of the recorded packet data, the recording/reproducing includes a counter that enables transmission of the received packet data at the same intervals of time that the packet data was transmitted. The counter operates in response to system clocks that are driven at frequency of 90 Khz or 27 Mhz, and allows packet data to be recorded to include a counter value determined at an instant of time when a packet is incoming. Next, the packet data is transmitted to a buffer included in the decoder at intervals of time as defined in the counter value allocated to the packet data. The counter is called an arrival time clock (ATC) counter. That is, an arrival time stamp (ATS) is added into incoming data using the ATC counter, and the data is reproduced based on the ATS.

Here, the incoming data is a transport stream, i.e., packetized data, as described with reference to FIG. 1. Packetized data includes video or audio data that is divided into predetermined units and transmitted through a satellite, cable, or a local area network (LAN). Here, the predetermined unit is 188 bytes long when using an MPEG-2 transmission stream in the ISO/IEC 13818-1 standard and is 53 bytes long when using the asynchronous transfer mode (ATM).

Digital broadcasting is transmitted in a packet data format at variable intervals of time. The transmitted packet data is input to a buffer having a decoder at a receiving side and decoded by the decoder, so that a user can view the digital broadcasting. The packet data is temporarily stored and output to the decoder to be reproduced at time a user desires. Here, the uniformless intervals of time at which the original packet data was transmitted are significant when the packet data is output to the decoder. If the uniformless intervals of time are not abided by, the

buffer at the receiving side overflows or underflows.

In general, a transmitting side transmits a plurality of packet data while adjusting a gap between transmissions of packet data, in consideration of the state of a buffer having a decoder at a receiving side. Therefore, the arrival times of the respective packet data transmitted to a recording apparatus are recorded in all packets and the packet data is reproduced based on the arrival times.

FIG. 3 illustrates the structure of a reference player model that reproduces packet data containing ATS as illustrated in FIG. 2.

A reproducing apparatus includes an ATC counter that enables transmission of data streams recorded in a recording apparatus to a decoder at the same intervals of time that packet data was transmitted from a transmitting side. The ATC counter operates in response to system clocks driven at frequency of 90 Khz of 27 Mhz, and resets an ATS value, which is determined at an instant of time when a first packet of a transport stream is input to a source de-packetizer, as an initial counter value. Next, the ATC counter continues a counting operation with respect to next packets of the transport stream. When the ATS value of a packet of the transport stream is equivalent to the initial counter value, the ATC controller removes the ATS from the packet and outputs the packet to the decoder.

The packet of the transport stream input to the decoder is a first 8-bit sync-byte indicating start of a new packet. Here, the transport stream contains a program ID (PID) and the PID is used to sort out PES packets contained in the packet. It is possible to restore a PES packet with all of transport stream packets with the same PID. Program clock reference (PCR), which is encoding time-information, may be contained into the transport stream packet. The time information denotes a value indicating time when a packet is input to a decoding buffer and enables encoding time to be equivalent to decoding time.

FIG. 4 illustrates the structure of a standard decoder that makes two data be synchronized with each other using encoded time information such as PCR, Presentation Time Stamps (PTS), and DTS.

The decoder includes a counter, for data decoding, which is driven at frequency of 90 Khz or 27Mhz and a packet is input a buffer that is included in the decoder. The counter controls an ATS value of a packet at an instant of time when the packet is input to the buffer, to be equivalent to a PCR value of the packet. The counter is called a system time clock (STC) counter. Audio data and video data can

be in phase with each other by controlling decoding or output of the audio and video data when an STC value is match PTS time and DTS time. That is, the decoder of FIG. 4 is constructed such that audio and video data can be in phase by controlling decoding of the audio and video data with a clock.

The structure of the decoder is appropriate for reproduction of video object data. In general, there are two types of still images. The first type of still image is output at a predetermined time. When a user performs a reverse play, or a skip operation for reproducing a previous image, an STC value is updated with a new STC value and the reproduction of the still image restarts.

If audio data is included in the still image, the audio data is reproduced in synchronization with a still image that is newly updated. Thus, the reproduction of the audio data stops and restarts starting from a portion of the audio data related to the new still image. The still image is called a slide show.

The second type of still image is a browsable slide show. To reproduce the browsable slide show, seamless reproduction of audio data is required even if a user performs the reverse play or the skip operation. However, it is difficult to satisfactorily reproduce the browsable slide show using a conventional reproducing apparatus with the above decoding structure.

Further, a conventional reproducing apparatus is disadvantageous in that reproduction of audio data is interrupted when transition of still images of a browsable slide show is caused in response to a user input.

SUMMARY OF THE INVENTION

The present invention provides a still image reproducing apparatus that enables continuous, seamless reproduction of audio data, which is reproduced as background music, even during transition of still images.

According to an aspect of the present invention, there is provided a still image reproducing apparatus including a packet stream buffer for video object data and still images, and a packet stream buffer for sub audio; a de-packetizer for video object data or still images, and a de-packetizer for sub audio; an arrival time clock (ATC) counter for video object data or still images, and an ATC counter for sub audio; a de-multiplex that divides video object data into video data and audio data; a video decoder with a built-in buffer, and an audio/sub audio decoder with a built-in buffer; and a system time clock (STC) counter for video, and an STC counter for audio and

sub audio.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 illustrates a hierarchical encoding method included in Motion Picture Expert Groups (MPEG) system encoding;

FIG. 2 illustrates a basic format of data recorded to include arrival time of incoming packet data and the relationship between the arrival time and output time of data reproduced;

FIG. 3 is a block diagram illustrating the structure of a reference player model that reproduces packet data including arrival time stamps shown in FIG. 2;

FIG. 4 is a block diagram illustrating the structure of a standard decoder that makes two data be in phase using encoded time information such as PCR, PTS, and DTS; and

FIG. 5 is a block diagram illustrating the structure of a reproducing apparatus that reproduces a still image browsable slide show.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawing(s).

FIG. 5 is a block diagram illustrating the structure of a reproducing apparatus that reproduces a still image browsable slide show. Referring to FIG. 5, the reproducing apparatus includes a packet stream buffer for video object data and/or still images, a packet stream buffer for sub audio, a de-packetizer for video object data and/or still images, a de-packetizer for sub audio, an arrival time clock (ATC) counter for video object data and/or still images, an ATC counter for sub audio, a de-multiplex that divides video object data into video data and audio data, a video decoder with a built-in buffer, an audio/sub audio decoder with a built-in buffer, system time clock (STC) counter for video, and an STC counter for audio/sub audio.

Data recorded on a recording medium is read from the recording medium using a BD drive, and video object data and/or still image data and sub audio data are buffered by related buffers, respectively. The reproducing apparatus of FIG. 5,

which can reproduce a browsable slide show, sets and counts ATC values and STC values of a still image and sub audio, since the sub audio must be continuously reproduced without seam regardless of navigation of the still image.

Therefore, as shown in FIG. 5, the reproducing apparatus individually includes an ATC counter for video object data and/or a still image and an ATC counter for sub audio, and an STC counter for video and an STC counter for audio/sub audio. Thus, for reproduction of a previous still image or a next still image in response to user's input, the reproducing apparatus transmits still image data to a related decoder based on arrival time stamps (ATSs) contained in the still image data and an a related decoder decodes or reproduces data based on a STC value. Sub audio is reproduced with its own ATC value and STC value, that is, is reproduced regardless of navigation of the still image, thereby enabling continuous seamless reproduction of audio.

In this disclosure, the present invention is accomplished with a transport stream using multiplexing but a program stream can be also used.

The present invention can be embodied as a computer readable code in a computer readable medium. Here, the computer readable medium may be any recording apparatus capable of storing data that is read by a computer system, e.g., a read-only memory (ROM), a random access memory (RAM), a compact disc (CD)-ROM, a magnetic tape, a floppy disk, an optical data storage device, and so on. Also, the computer readable medium may be a carrier wave that transmits data via the Internet, for example. The computer readable recording medium can be distributed among computer systems that are interconnected through a network, and the present invention may be stored and implemented as a computer readable code in the distributed system. .

While the present invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

As described above, a reproducing apparatus according to the present invention enables continuous, seamless reproduction of audio during reproduction of a browsable slide show. That is, since system clocks for data for still images and sub audio for background music are individually managed, audio can be

continuously reproduced without seam during reproduction of a browsable slide show, regardless of navigation of the still images.

What is claimed is:

1. A still image reproducing apparatus comprising:

a packet stream buffer for video object data and still images, and a packet stream buffer for sub audio;

a de-packetizer for video object data or still images, and a de-packetizer for sub audio;

an arrival time clock (ATC) counter for video object data or still images, and an ATC counter for sub audio;

a de-multiplex that divides video object data into video data and audio data;

a video decoder with a built-in buffer, and an audio/sub audio decoder with a built-in buffer; and

a system time clock (STC) counter for video, and an STC counter for audio and sub audio.

2. The still image reproducing apparatus of claim 1, further comprising a clock for reproduction of audio and sub audio,

wherein reproduction of audio does not stop even if a user inputs a signal for reproducing a previous still image and a next still image during reproduction of a browsable slide show.

3. The still image reproducing apparatus of claim 1, wherein the still image is encoded according to the Motion Picture Expert Groups (MPEG) standard, and sub audio data is recorded in a format of Linear Pulse Code Modulation (PCM) audio data that is not compressed and encoded or a format of audio data that is compressed and encoded using an AC3 method, the sub audio data being reproduced together with the still image during reproduction of browsable slide show.

Abstract of the Disclosure

A still image slide show reproducing apparatus is provided. The reproducing apparatus includes a packet stream buffer for video object data and still images, and a packet stream buffer for sub audio; a de-packetizer for video object data or still images, and a de-packetizer for sub audio; an arrival time clock (ATC) counter for video object data or still images, and an ATC counter for sub audio; a de-multiplex that divides video object data into video data and audio data; a video decoder with a built-in buffer, and an audio/sub audio decoder with a built-in buffer; and a system time clock (STC) counter for video, and an STC counter for audio and sub audio. Accordingly, the reproducing apparatus is capable of reproducing audio continuously without seam regardless of navigation of still images, during reproduction of a slide show.

FIG. 1 (PRIOR ART)

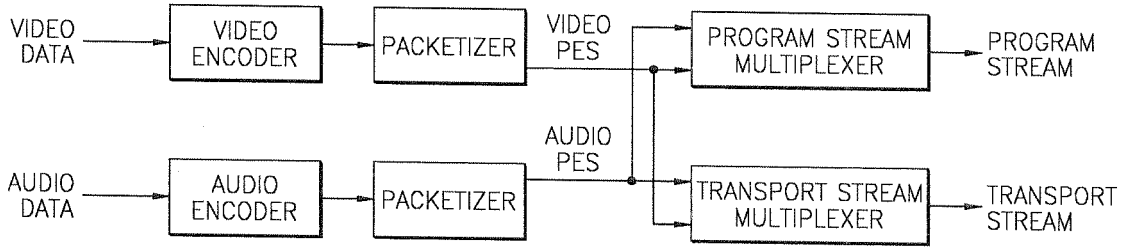


FIG. 2

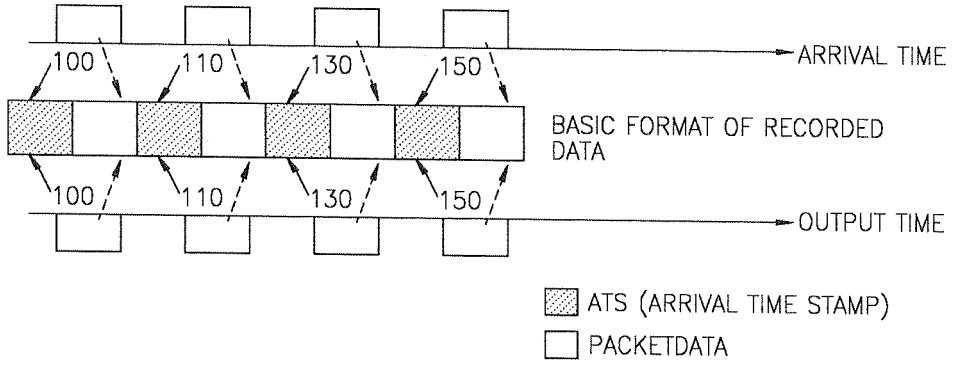


FIG. 3

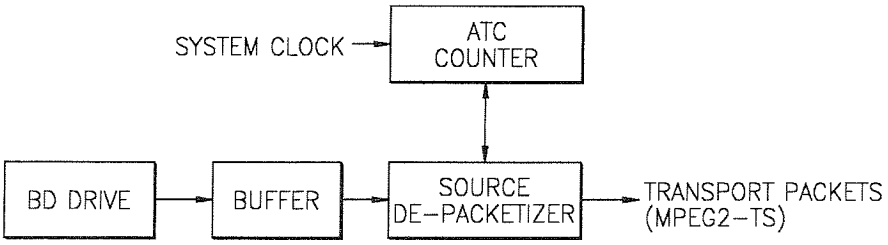


FIG. 4 (PRIOR ART)

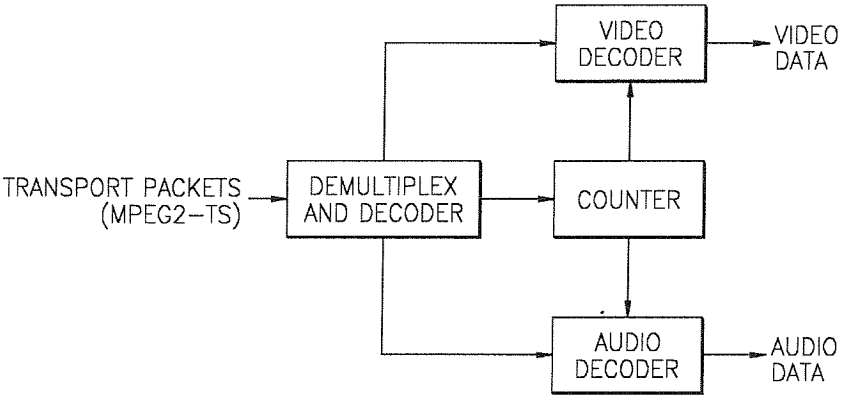
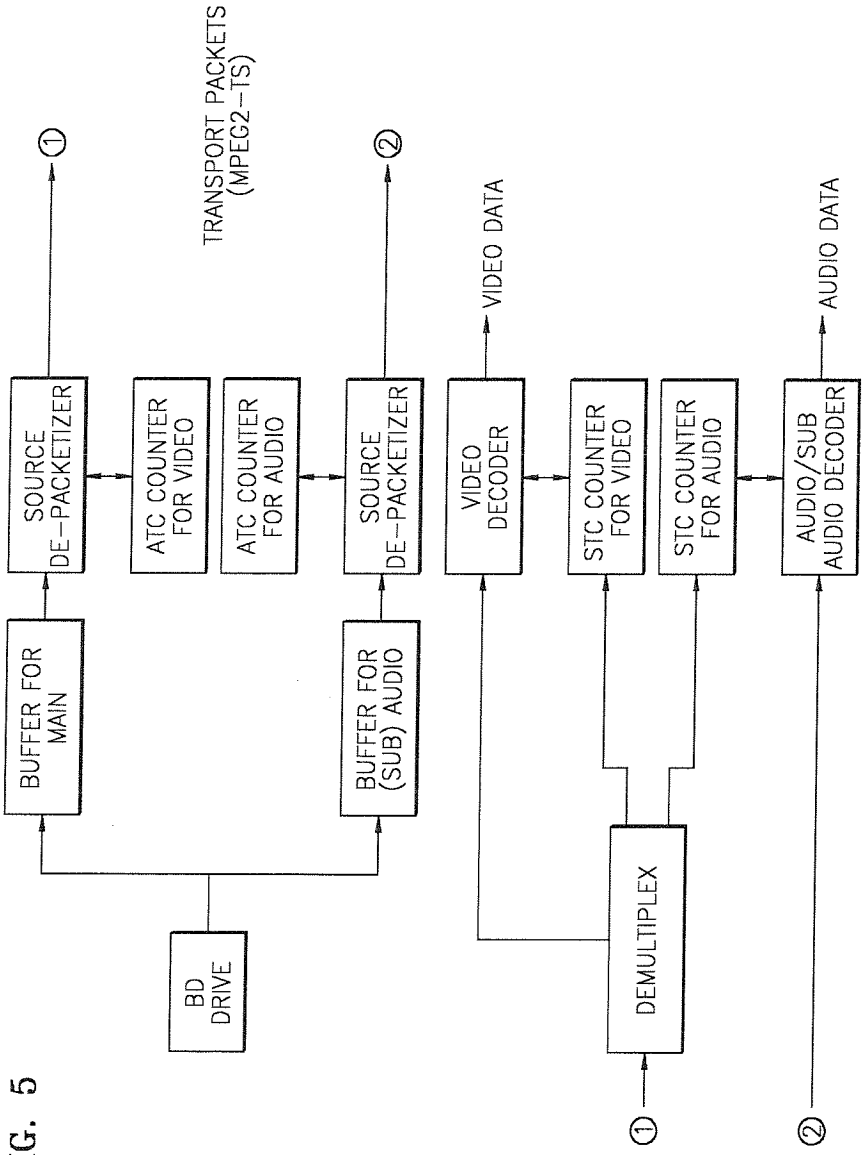


FIG. 5


BD DRIVE
BUFFER FOR MAIN
BUFFER FOR (SUB) AUDIO
SOURCE DE-PACKETIZER
SOURCE DE-PACKETIZER
ATC COUNTER FOR VIDEO
ATC COUNTER FOR AUDIO
TRANSPORT PACKETS (MPEG2-TS)
①
②
VIDEO DECODER
VIDEO DATA
STC COUNTER FOR VIDEO
STC COUNTER FOR AUDIO
DEMULTIPLEX
AUDIO/SUB AUDIO DECODER
AUDIO DATA
①
②